NOT of record

0.1 mS/cm

- no glycol!
- phosphoric Acid
- no vehicle ("on-site" only)

PATENT ABSTRACTS OF JAPAN

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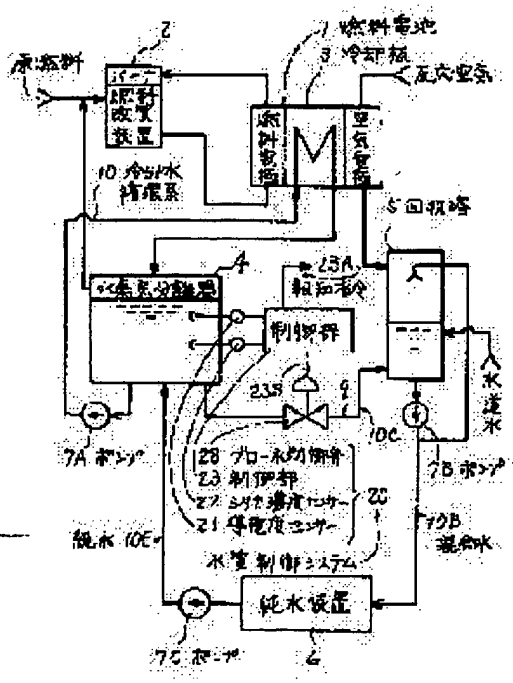
(54) COOLING WATER REFILLING DEVICE OF WATER-COOLED FUEL CELL

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent liquid junction phenomenon and scale generation by sensing the concentration of impurities in cooling water, and giving a degree-of-opening command to a blow water control valve furnished in a blow water system.

SOLUTION: Impurities in a cooling water are condensed gradually in the process that the steam separated by a water-vapor separator 4 is supplied to a fuel reforming device 2, and in the course of operation, the concentration of the impurities in the cooling water rises gradually. The concentration is is sensed by a sensor 21 for measuring electroconductivity and a sensor 22 for silica concentration, and a degree-of-opening command 23S is given to a blow water control valve 28 from a control part 23 when either of the sensing values exceeds the reference value, and thereupon the rate of the flow of blow water 10C is controlled. The pure water 10E obtained by a purifying device 6 is fed back to the separator 4 to dilute the concentration of the impurities contained in the cooling water.



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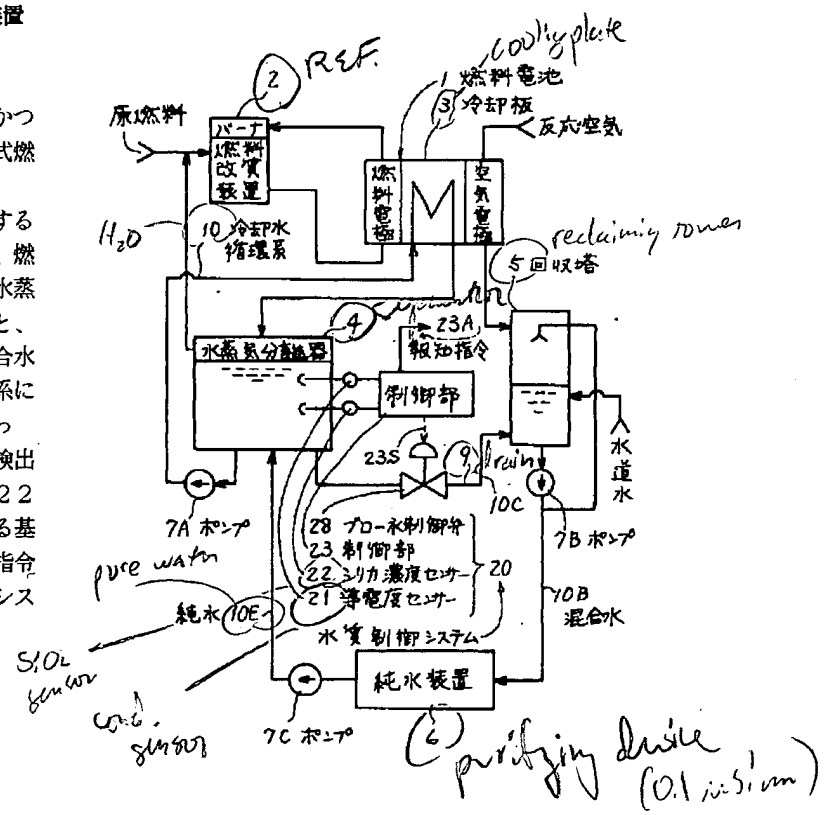
(54)【発明の名称】　水冷式燃料電池の冷却水補給装置

(57)【要約】
【目的】サイト間で冷却水の水質管理に差がなく、かつ液絡現象やスケールの発生を未然に防止できる水冷式燃料電池の冷却水補給装置を提供する。
【構成】燃料電池１の冷却板３に冷却水１Ａを循環する冷却水循環系１０を有する水冷式燃料電池における、燃料電池の排ガス中水分の回収塔５と、この回収塔に水蒸気分離器４からのブロー水を供給するブロー水系９と、この回収塔の回収水，ブロー水，および水道水の混合水１０Ｂを浄化した純水１０Ｅに変換して冷却水循環系に供給する純水装置６とを備えた冷却水補給装置であって、冷却水循環系の冷却水に含まれる不純物濃度を検出する導電度センサー２１およびシリカ濃度センサー２２と、両センサーのいずれかの検出レベルが予め定まる基準値を越えたときブロー水制御弁２８に向けて開度指令２３Ｓを発する制御部とからなる冷却水の水質制御システム２０を備える。



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【特許請求の範囲】

【請求項１】複数の単位セルと冷却板の積層体からなる燃料電池と、この燃料電池の冷却板に冷却水を循環する循環ポンプおよび水蒸気分離器を有する冷却水循環系とを有する水冷式燃料電池における、前記燃料電池の排ガス中水分の回収塔と、この回収塔に前記水蒸気分離器からのブロー水を供給するブロー水系と、この回収塔の回収水，ブロー水，および水道水の混合水を浄化した純水に変換して前記冷却水循環系に供給する純水装置とを備えた冷却水補給装置であって、前記冷却水循環系の冷却水に含まれる不純物の濃度を検出するセンサーと、このセンサーの検出レベルが予め定まる基準値を越えたとき前記ブロー水系のブロー水制御弁に向けて開度指令を発する制御部とからなる冷却水の水質制御システムを備えたことを特徴とする水冷式燃料電池の冷却水補給装置。

【請求項２】請求項１に記載の水冷式燃料電池の冷却水補給装置において、センサーが導電度測定用センサーおよびシリカ濃度測定用センサーからなり、制御部が前記センサーのいずれかの検出レベルが予め定まる基準値を越えたときブロー弁に向けて開度指令を発することを特徴とする水冷式燃料電池の冷却水補給装置。

【請求項３】請求項１に記載の水冷式燃料電池の冷却水補給装置において、制御部が、予め定まる基準値を大幅に越える異常な検出信号を検知したとき、異常報知機に向けて報知指令を発する異常報知部を備えたことを特徴とする水冷式燃料電池の冷却水補給装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】この発明は、オンサイト用発電装置などに用いられる水冷式燃料電池に、冷却水の補給および水質の保持を目的として設けられる冷却水補給装置に関する。

【０００２】

【従来の技術】図２は水冷式りん酸型燃料電池発電装置を例に示す従来装置の概略系統図であり、単位セルの積層体からなる燃料電池（スタック）１は複数の単位セル毎に積層された水冷パイプを有する冷却板３を備え、原燃料を水蒸気改質する燃料改質装置２からの燃料ガス２Ｆと、図示しない供給装置からの反応空気とを受けて電気化学反応に基づいて発電する。燃料電池１の電極反応は全体として発熱反応であり、その発電生成熱は冷却板３の冷却パイプに連結されて冷却水１０Ａを循環する循環ポンプ７Ａおよび水蒸気分離器４を有する冷却水循環系１０によって冷却され、燃料電池温度を約１９０°Ｃの運転温度に保持した状態で運転が行われる。

【０００３】また、燃料電池１から発電生成熱を奪って昇温した冷却水１０Ａは水蒸気分離器４内で水蒸気を分離することによって冷却され、水蒸気分離器４内で分離されたスチーム４Ｓは原燃料と混合されて燃料改質装置２に供給され、水蒸気改質反応に利用される。さらに、

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燃料電極で使い残された燃料ガス２Ｆ中の水素は燃料改質装置のバーナに送られて燃焼し、改質反応熱として利用される。

【０００４】冷却水循環系１０は水蒸気分離器４で分離したスチーム４Ｓを燃料改質装置２に供給することによって冷却水１０Ａが減少する。そこで、この冷却水の不足分を補給するために冷却水補給装置１１が設けられる。冷却水補給装置１１は水蒸気の回収塔５，純水装置６およびポンプ７Ｃ，７Ｄと、ブロー弁８を備えたブロー水系９とで構成される。水蒸気の回収塔５は回収した混合水１０Ｂを冷却媒体とする熱交換器を含み、燃料電池１の空気極側の空気オフガス中に水蒸気として含まれる発電生成水を凝縮して回収し、これに必要に応じて水道水を加えた混合水１０Ｂを、ポンプ７Ｂを介して純水装置６に供給する。純水装置６はフィルター，イオン交換樹脂式浄水器，などを含み、混合水中に含まれる塩素イオンなどの負イオンやカルシウムイオン，マグネシウムイオンなどの陽イオン（金属イオン）、さらにはシリカや微生物などの固形不純物を除去したイオン交換水（純水）１０Ｅとして冷却水循環系１０の例えば水蒸気分離器４に補給する。

【０００５】ところで、純水装置６は混合水１０Ｂ中の不純物イオンが負荷となってイオン交換樹脂のイオン吸着性能が徐々に低下する。そこで、従来の装置では純水装置６の出口側に電導度計１２を設け、その検出値が予め定まる一定値，例えば０．１μＳ／ｃｍを越えたとき、純水装置６のイオン交換樹脂を新しいものと交換することにより、冷却水循環系１０内の純水の電導度および不純物イオン濃度を一定レベルに保つ対策がとられている。

【０００６】また、冷却水循環系１０に補給された純水１０Ｅには微量ながら不純物が残っており、これがスチーム４Ｓを燃料改質装置２に供給する過程で徐々に濃縮されるため、運転時間が経過するとともに冷却水１０Ａ中の不純物濃度が上昇する。そこで、従来例では水蒸気分離器４と回収塔５との間にブロー水系９を設け、ブロー弁８を常時僅かに開くか，あるいは定期的にオンオフ制御してブロー水を回収塔５に送り、その分純水装置６から純水１０Ｅを補給して冷却水１０Ａ中の不純物濃度の上昇を抑制する対策がとられている。

【０００７】

【発明が解決しようとする課題】従来例においては、冷却水循環系内の純水に含まれる不純物濃度の管理を手作業によるブロー水の流量制御に頼っているため、例えば燃料電池発電装置がオンサイト用電源装置として異なる場所で複数台使用される場合、ブロー水の流量制御の仕方によって水質管理がまちまちになり易く、これが原因で冷却水１０Ａ中の不純物イオン濃度の上昇に伴って冷却水の導電度が上昇すると、これに伴って単位セル間で冷却水を介して発電電流の一部が漏れる液絡現象が発生

し、燃料電池発電装置の発電効率に差が生ずるという不都合を生じ易くなる。また、カルシウム，マグネシウムや固形不純物としてのシリカ濃度の上昇は冷却パイプや冷却水循環系の内壁面でのスケールの発生を招き、熱交換面での熱抵抗の増加によって燃料電池温度が上昇するという悪影響が発生するとともに、剥離したスケールの堆積により配管の流体抵抗が増加したり，あるいはバルブの閉塞を招くなどの不都合を生ずる燃料電池発電装置も発生する。

【０００８】この発明の目的は、サイト間で冷却水の水質管理に差がなく、かつ液絡現象やスケールの発生を未然に防止できる水冷式燃料電池の冷却水補給装置を提供することにある。

【０００９】

【課題を解決するための手段】前述の目的を達成するために、請求項１に記載の発明は、複数の単位セルと冷却板の積層体からなる燃料電池と、この燃料電池の冷却板に冷却水を循環する循環ポンプおよび水蒸気分離器を有する冷却水循環系とを有する水冷式燃料電池における、前記燃料電池の排ガス中水分の回収塔と、この回収塔に前記水蒸気分離器からのブロー水を供給するブロー水系と、この回収塔の回収水，ブロー水，および水道水の混合水を浄化した純水に変換して前記冷却水循環系に供給する純水装置とを備えた冷却水補給装置であって、前記冷却水循環系の冷却水に含まれる不純物の濃度を検出するセンサーと、このセンサーの検出レベルが予め定まる基準値を越えたとき前記ブロー水系のブロー水制御弁に向けて開度指令を発する制御部とからなる冷却水の水質制御システムを備える。

【００１０】ここで、請求項２に記載の発明は、センサーが導電度測定用センサーおよびシリカ濃度測定用センサーからなり、制御部が前記センサーのいずれかの検出レベルが予め定まる基準値を越えたときブロー水制御弁に向けて開度指令を発するよう構成すると良い。また、請求項３に記載の発明は、制御部が予め定まる基準値を大幅に越える異常な検出信号を検知したとき、異常報知機に向けて報知指令を発する異常報知部を備えるよう構成すると良い。

【００１１】

【作用】請求項１に記載の発明では、水質制御システムが冷却水循環系内の冷却水に含まれる不純物の濃度をセンサーで検出し、このセンサーの検出レベルが予め定まる基準値を越えたときブロー水制御弁に向けて開度指令を発するようにしたので、従来設けられているブロー水系，発電生成水の回収塔，および純水装置と連系して冷却水循環系内の不純物の濃縮を自動的に防止する水質制御機能が得られる。また、オンサイト電源用の複数の燃料電池発電装置の冷却水補給装置がそれぞれ混合水の水質やイオン交換樹脂の吸着能力に差を有する場合にも、ブロー水量の制御によって各燃料電池発電装置の冷却水循環系内の水質が一定レベルに自動的に保持される。

【００１２】ここで、請求項２に記載の発明では、冷却水中の不純物濃度を検出するセンサーを導電度測定用センサーおよびシリカ濃度測定用センサーとし、制御部がいずれか一方のセンサーの検出レベルが予め定まる基準値を越えたときブロー水制御弁に向けて開度指令を発するようにしたので、塩素イオン，カルシウムイオン，マグネシウムイオンなどの濃縮は導電度測定用センサーによってイオン導電度の低下として検出され、また導電度の低下として検出できない固形不純物としてのシリカはシリカ濃度測定用センサーによって検出される。したがって、液絡現象の発生原因となる冷却水の導電度の低下を防止する機能と、スケールの堆積の原因となるカルシウムイオン，マグネシウムイオン，およびシリカの堆積を防止する機能とを併せ持った精度の高い水質管理機能が得られる。

【００１３】また、請求項３に記載の発明では、制御部が予め定まる基準値を大幅に越える異常な検出信号を検知したとき、異常報知機に向けて報知指令を発する異常報知部を備えるようにしたので、異常報知機のアラームを純水装置の能力低下を報知する信号と判断して、例えばフィルターのろ過材の交換やイオン交換樹脂の交換を行うことにより、純水装置を常時清浄な状態に保持して精度の高い水質管理を行うことができる。

【００１４】

【実施例】以下この発明を実施例に基づいて説明する。なお、従来例と同じ参照符号を付けた部材は従来例のそれと同じ機能をもつので、その説明を省略する。図１はこの発明の一実施例を水冷式りん酸型燃料電池発電装置の冷却水補給装置を例に示す概略系統図である。図において、水質制御システム２０は、水蒸気分離器４内の冷却水１０Ａのイオン導電度を検出する導電度測定用センサー２１、およびシリカ濃度測定用センサー２２と、いずれか一方のセンサーの検出レベルが予め定まる基準値を越えたときブロー水制御弁２８に向けて開度指令２３Ｓを発する制御部２３とで構成される。また、この水質制御システム２０が、従来設けられているブロー水系９，発電生成水の回収塔５，および純水装置６と連系動作することにより、冷却水循環系１０内の冷却水１０Ａに含まれる不純物の濃縮を自動的に防止する機能を備えた冷却水補給装置が構成される。

【００１５】即ち、実施例において、純水装置６で得られるイオン交換水１０Ｅの導電度を０．１μＳ／ｃｍ，シリカ濃度を０．０２ｐｐｍとした場合、制御部２３に上記値の数倍程度の値を基準値として予め設定しておく。この状態で発電運転が行われると、水蒸気分離器４が分離したスチーム４Ｓを燃料改質装置２に供給する過程で冷却水１０Ａ中の不純物イオンやシリカなどの固形不純物が徐々に濃縮され、運転時間が経過するとともに冷却水１０Ａ中の不純物濃度が徐々に上昇する。この実

施例の特徴は、液絡現象の発生原因となる塩素イオン，カルシウムイオン，マグネシウムイオンなどの濃縮は導電度測定用センサーによってイオン導電度の低下として導電度測定用センサー２１で検出し、導電度測定用センサー２１で検出できないシリカなどの固形不純物はシリカ濃度測定用センサー２２で検出するようにした点にある。したがって、いずれか一方の検出値がそれぞれの基準値を越えると制御部２３からブロー水制御弁２８に向けて開度指令２３Ｓが出力され、これに基づいてブロー水１０Ｃの流量が制御され、その分，純水装置６で処理された純水１０Ｅが水蒸気分離器４に還流されて冷却水１０Ａ中の不純物濃度が希釈され、液絡現象による発電性能の低下やスケールの堆積による冷却性能の低下を未然に防止することができる。

【００１６】また、オンサイト電源用の複数の燃料電池発電装置の冷却水補給装置がそれぞれ混合水の水質やイオン交換樹脂の吸着能力に差を有する場合にも、ブロー水の通流量の自動制御によって冷却水循環系１０内の水質を一定レベルに保持できるので、複数台の燃料電池発電装置の冷却水循環系の水質を労力を殆ど必要とせずに一定レベルに管理できる利点が得られる。

【００１７】なお、導電度測定用センサー２１，シリカ濃度測定用センサー２２のいずれが動作するかは混合水１０Ｂの水質および純水装置６の不純物除去性能に関係して決まる。したがって、この点に留意してセンサーの組み合わせを決めることにより、導電度の低下に起因する液絡現象の発生，およびスケールの堆積を自動的に防止できる高度な水質管理機能が得られる。また、逆に不純物イオンの濃縮が起こり易い装置では導電度測定用センサーのみを設け，固形不純物が堆積し易い装置ではシリカ濃度測定用センサーのみを設け、水質制御システムの構成を簡素化するようにしてもよい。

【００１８】一方、図１において、制御部２３が導電度測定用センサー２１または金属イオン濃度測定用センサー２２から予め定まる基準値を大幅に越える異常な検出信号を受けたとき、図示しない異常報知機に向けて報知指令２３Ａを出力するよう構成すれば、この異常報知機のアラームを受けた運転員が純水装置に能力低下が発生したものと判断して、例えばフィルターのろ過材の交換やイオン交換樹脂の交換を行うことにより、水質制御システム２０を利用して純水装置６の保守タイミングをも均等に管理することが可能になり、したがって、オンサイト電源用の複数の燃料電池発電装置の冷却水循環系の水質管理をより一層均等化できる利点が得られる。

【００１９】

【発明の効果】この発明の水冷式燃料電池の冷却水補給装置は前述のように、水冷式燃料電池の冷却水循環系にイオン濃度測定用センサーおよびその制御部からなる水質制御システムを設け、冷却水中のイオン濃度が規定値を越えたときブロー水通流量を増すよう構成した。その結果、冷却水補給装置がブロー水通流量に対応して自動的に純水を補給し、冷却水中のイオン濃度を希釈するので、従来技術で問題になった冷却水中のイオン濃度の濃縮が回避され、液絡現象やスケールの発生がなく安定した冷却性能が得られる冷却水補給装置を備えた水冷式燃料電池発電装置を提供することができる。ことに、オンサイト電源用の複数の燃料電池発電装置の冷却水補給装置がそれぞれ混合水の水質やイオン交換樹脂の吸着能力に差を有する場合にも、ブロー水の通流量の自動制御によって冷却水循環系内の水質を一定レベルに保持できるので、複数台の燃料電池発電装置の冷却水循環系の水質を労力を殆ど必要とせずに一定レベルに管理できる利点が得られる。

【００２０】さらに、導電度測定用センサーおよび金属イオン濃度測定用センサーを設けることにより、両者の相補作用を利用してより精度の高い水質管理を行える利点が得られる。一方、水質制御システムにアラーム機能を付加することにより、純水装置の保守タイミングをも均等に管理することが可能になり、したがって、オンサイト電源用の複数の燃料電池発電装置の冷却水循環系の水質管理をより一層均等化できる利点が得られる。

【図面の簡単な説明】

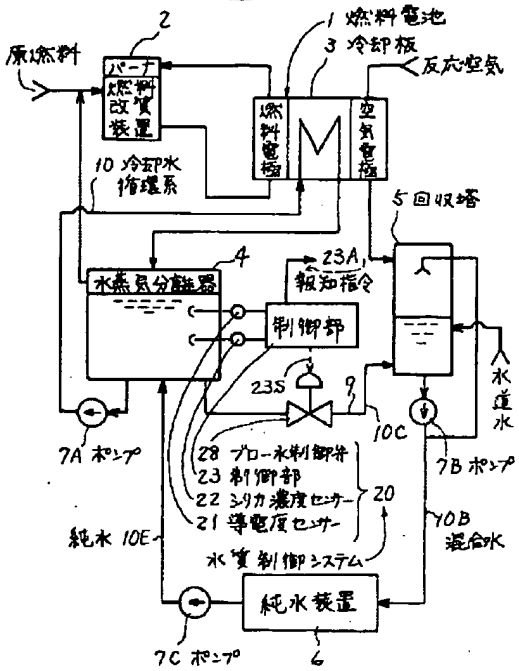
【図１】この発明の一実施例を水冷式りん酸型燃料電池発電装置の冷却水補給装置を例に示す概略系統図

【図２】水冷式りん酸型燃料電池発電装置を例に示す従来装置の概略系統図

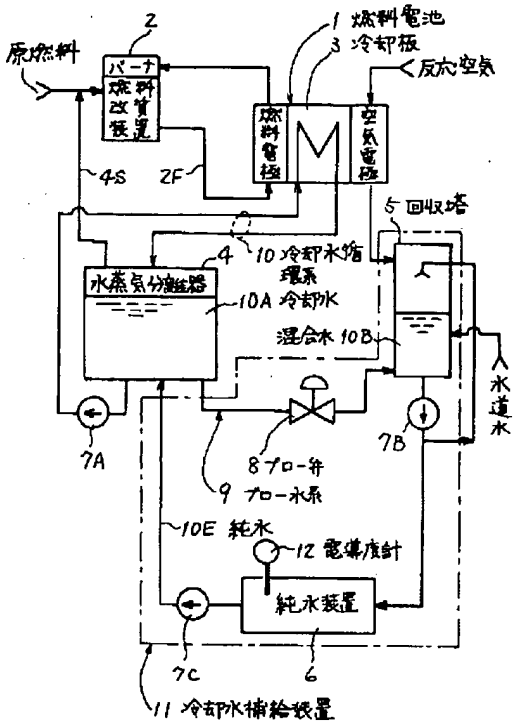
【符号の説明】

１　燃料電池
２　燃料改質装置
３　冷却板
４　水蒸気分離器
５　発電生成水の回収塔
６　純水装置
８　ブロー弁
９　ブロー水系
１０　冷却水循環系
１０Ａ　冷却水
１０Ｂ　混合水
１０Ｅ　純水（イオン交換水）
１１　冷却水補給装置
１２　導電度計
２０　水質制御システム
２１　導電度測定用センサー
２２　金属イオン濃度測定用センサー
２３　制御部
２３Ｓ　報知指令
２８　ブロー水制御弁

【図1】


2
1 燃料電池
3 冷却板
原燃料
パーナ
燃料改質装置
燃料電極
空気電極
反応空気
10 冷却水循環系
5 回収塔
4
水蒸気分離器
23A 報知指令
制御部
23S
9
10C
水道水
7A ポンプ
7B ポンプ
28 ブロー水制御弁
23 制御部
22 シリカ濃度センサー
21 導電度センサー
20
純水 10E
10B 混合水
水質制御システム
純水装置
7C ポンプ
6

【図2】


2
1 燃料電池
3 冷却板
原燃料
パーナ
燃料改質装置
燃料電極
空気電極
反応空気
4S
2F
5 回収塔
4
10 冷却水循環系
水蒸気分離器
10A 冷却水
混合水 10B
水道水
7A
7B
8 ブロー弁
9 ブロー水系
10E 純水
12 電導度計
純水装置
7C
6
11 冷却水補給装置

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The fuel cell which consists of two or more unit cells and a layered product of a cooling plate. The demineralizer which changes into the reclaiming tower for exhaust gas Nakamizu of the aforementioned fuel cell in the water cooling type fuel cell which has the cooling-water-flow system which has the circulating pump and steam eliminator which circulate through cooling water to the cooling plate of this fuel cell, the blow drainage system which supplies the blow water from the aforementioned steam eliminator to this reclaiming tower, the recycled water of this reclaiming tower, blow water, and the pure water that purified the mixed water of tap water, and is supplied to the aforementioned cooling-water-flow system. It is cooling water supply equipment of the water cooling type fuel cell equipped with the above, and is characterized by having the water quality control system of the cooling water which consists of a sensor which detects the concentration of the impurity contained in the cooling water of the aforementioned cooling-water-flow system, and a control section which emits opening instructions towards the blow groin valve of the aforementioned blow drainage system when the disregard level of this sensor exceeds the reference value which becomes settled beforehand.
[Claim 2] Cooling water supply equipment of a water cooling type fuel cell with which a control section is characterized by emitting opening instructions towards a blow down valve when the reference value with which one disregard level of the aforementioned sensors becomes settled beforehand is exceeded in the cooling water supply equipment of a water cooling type fuel cell according to claim 1 by a sensor consisting of a sensor for conductivity measurement, and a sensor for silica density measurement.
[Claim 3] Cooling water supply equipment of the water cooling type fuel cell characterized by having the unusual information section which emits information instructions towards an unusual alarm when a control section detects the unusual detecting signal sharply exceeding the reference value which becomes settled beforehand in the cooling water supply equipment of a water cooling type fuel cell according to claim 1.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the cooling water supply equipment formed in the water cooling type fuel cell used for the power plant for on site etc. for the purpose of supply of cooling water and maintenance of water quality.
[0002]
[Description of the Prior Art] Drawing 2 is the outline schematic diagram of equipment conventionally which shows a water cooling type phosphoric acid type fuel cell power plant to an example, and the fuel cell (stack) 1 which consists of a layered product of a unit cell is equipped with the cooling plate 3 which has the water-cooled pipe by which the laminating was carried out for two or more unit cells of every, and it generates it based on electrochemical reaction in response to fuel gas 2F from the fuel reformer 2 which carries out steam reforming of the original fuel, and the reaction air from the feeder which is not illustrated. The electrode reaction of a fuel cell 1 is exothermic reaction as a whole, the power generation heat of formation is cooled by the cooling-water-flow system 10 which has circulating-pump 7A and the steam eliminator 4 which are connected with the cooling pipe of a cooling plate 3, and circulate through cooling water 10A, and operation is performed where fuel cell temperature is held to the operating temperature of about 190 degreeC.
[0003] Moreover, cooling water 10A which took and carried out the temperature up of the power generation heat of formation from the fuel cell 1 is cooled by separating a steam within the steam eliminator 4, and it is mixed with original fuel, and steam 4S separated within the steam eliminator 4 are supplied to the fuel reformer 2, and are used for a steam-reforming reaction. Furthermore, the hydrogen in fuel gas 2F left unspent by the fuel electrode is sent to the burner of a fuel reformer, burns, and is used as reforming heat of reaction.
[0004] When the cooling-water-flow system 10 supplies steam 4S separated with the steam eliminator 4 to the fuel reformer 2, cooling water 10A decreases. Then, in order to supply the insufficiency of this cooling water, cooling water supply equipment 11 is formed. Cooling water supply equipment 11 consists of the reclaiming tower 5 of a steam, a demineralizer 6 and pumps 7C and 7D, and a blow drainage system 9 equipped with the blow down valve 8. The reclaiming tower 5 of a steam condenses and collects the power generation generation water contained as a steam the inside of the air pole side of a fuel cell 1 air being off-gas including the heat exchanger which makes a cooling medium collected mixed-water 10B, and supplies mixed-water 10B which added tap water to this if needed to a demineralizer 6 through pump 7B. A demineralizer 6 is supplied to the steam eliminator 4 of the cooling-water-flow system 10 including a filter, an ion-exchange-resin formula water purifier, etc. as cations (metal ion), such as anions, such as a chloride ion contained in a mixed water, and calcium ion, magnesium ion, and ion-exchange-water (pure water) 10E which removed solid impurities, such as a silica and a microorganism, further.
[0005] By the way, the impurity ion in mixed-water 10B serves as a load, and, as for a demineralizer 6, the ion adsorptivity ability of ion exchange resin falls gradually. Then, with conventional equipment, the measures which maintain the electric conductivity and impurity ion concentration of pure water in the cooling-water-flow system 10 at fixed level are taken by forming electric conductivity 12 [a total of] in the outlet side of a demineralizer 6, and exchanging the ion exchange resin of a demineralizer 6 for a new thing, when the constant value in which the detection value becomes settled beforehand, for example, 0.1microS/cm, is exceeded.
[0006] Moreover, the impurity remains in pure water 10E supplied to the cooling-water-flow system 10 with the minute amount, and since it is gradually condensed in process in which this supplies steam 4S to the fuel reformer 2, while operation time passes, the high impurity concentration in cooling water 10A goes up. Then, in the conventional example, the blow drainage system 9 is formed between the steam eliminator 4 and a reclaiming tower 5, a blow down valve 8 is always opened slightly, or on-off control is carried out periodically, blow water is sent to a reclaiming tower 5, and the measures which supply pure water 10E from the part demineralizer 6, and suppress elevation of the high impurity concentration in cooling water 10A are taken.
[0007]
[Problem(s) to be Solved by the Invention] Since it depends for management of the high impurity concentration contained in the pure water in a cooling-water-flow system on the control of flow of the blow water by the handicraft in the conventional example, For example, when two or more sets are used in the place where fuel cell power plants differ as a power unit for on site, If water quality management tends to become various and the conductivity of cooling water goes up with elevation of the impurity ion concentration in cooling water 10A owing to this by the method of the control of flow of blow water The liquid junction phenomenon in which a part of power generation current leaks through cooling water in connection with this between unit cells occurs, and it becomes easy to produce un-arranging [that a difference arises in the generating efficiency of a fuel cell power plant]. Moreover, elevation of the silica concentration as calcium, magnesium, or a solid impurity causes generating of a cooling pipe and the scale in the internal surface of a cooling-water-flow system, while the bad influence that fuel cell temperature rises by the increase in the thermal resistance in a heat-exchange side occurs, the flow resistance of piping increases by deposition of the exfoliative scale, or the fuel cell power plant which produces un-arranging, such as causing lock out of a bulb, is also generated.
[0008] The purpose of this invention is to offer the cooling water supply equipment of a water cooling type fuel cell which there is no difference in water quality management of cooling water between sites, and can prevent generating of a liquid junction phenomenon and a scale beforehand.
[0009]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, invention according to claim 1 It can set to the water

cooling type fuel cell which has the fuel cell which consists of two or more unit cells and a layered product of a cooling plate, and the cooling-water-flow system which has the circulating pump and steam eliminator which circulate through cooling water to the cooling plate of this fuel cell. The reclaiming tower for exhaust gas Nakamizu of the aforementioned fuel cell, and the blow drainage system which supplies the blow water from the aforementioned steam eliminator to this reclaiming tower, It is cooling water supply equipment equipped with the demineralizer which changes into the recycled water of this reclaiming tower, blow water, and the pure water that purified the mixed water of tap water, and is supplied to the aforementioned cooling-water-flow system. It has the water quality control system of the cooling water which consists of a sensor which detects the concentration of the impurity contained in the cooling water of the aforementioned cooling-water-flow system, and a control section which emits opening instructions towards the blow groin valve of the aforementioned blow drainage system when the disregard level of this sensor exceeds the reference value which becomes settled beforehand.

[0010] Here, as for invention according to claim 2, it is good to constitute so that it may emit opening instructions towards a blow groin valve, when one disregard level of the aforementioned sensors exceeds the reference value with which a sensor consists of a sensor for conductivity measurement and a sensor for silica density measurement, and a control section becomes settled beforehand. Moreover, when a control section detects the unusual detecting signal sharply exceeding the reference value which becomes settled beforehand, as for invention according to claim 3, it is good to constitute so that it may have the unusual information section which emits information instructions towards an unusual alarm.

[0011]

[Function] In invention according to claim 1, a sensor detects the concentration of the impurity with which a water quality control system is contained in the cooling water in a cooling-water-flow system. Since opening instructions were emitted towards the blow groin valve when the disregard level of this sensor exceeded the reference value which becomes settled beforehand The reclaiming tower of the blow drainage system prepared conventionally and power generation generation water and the water quality control function which links with a demineralizer and prevents automatically concentration of the impurity in a cooling-water-flow system are obtained. moreover, the case where the cooling water supply equipment of two or more fuel cell power plants for on-site power supplies has a difference in the water quality of a mixed water, or the adsorption capacity force of ion exchange resin, respectively -- a blow -- the water quality in the cooling-water-flow system of each fuel cell power plant is automatically held by control of amount of water at fixed level

[0012] By invention according to claim 2, the sensor which detects the high impurity concentration in cooling water is used as the sensor for conductivity measurement, and the sensor for silica density measurement here. Since opening instructions were emitted towards the blow groin valve when a control section exceeded the reference value with which the disregard level of one of sensors becomes settled beforehand The silica as a solid impurity which concentration of a chloride ion, calcium ion, magnesium ion, etc. is detected as a fall of ion conductivity by the sensor for conductivity measurement, and cannot be detected as a fall of conductivity is detected by the sensor for silica density measurement. Therefore, the function to prevent the fall of the conductivity of the cooling water leading to [of a liquid junction phenomenon] generating, the calcium ion constituting the cause of deposition of a scale, magnesium ion, and the water quality function manager having the function to prevent deposition of a silica with a high precision are obtained.

[0013] Moreover, since it had the unusual information section which emits information instructions towards an unusual alarm when a control section detected the unusual detecting signal sharply exceeding the reference value which becomes settled beforehand in invention according to claim 3 By judging the alarm of an unusual alarm to be the signal which reports the capacity fall of a demineralizer, for example, performing exchange of the filter medium of a filter, and exchange of ion exchange resin, a demineralizer can be held in the always pure state and water quality management with a high precision can be performed.

[0014]

[Example] This invention is explained based on an example below. In addition, since the member which attached the same reference mark as the conventional example has the same function as it of the conventional example, the explanation is omitted. Drawing 1 is the outline schematic diagram showing the cooling water supply equipment of a water cooling type phosphoric acid type fuel cell power plant for one example of this invention for an example. In drawing, the water quality control system 20 consists of control sections 23 which emit opening instruction 23S towards the blow groin valve 28, when the disregard level of the sensor 21 for conductivity measurement which detects the ion conductivity of cooling water 10A in the steam eliminator 4 and the sensor 22 for silica density measurement, and one of sensors exceeds the reference value which becomes settled beforehand. Moreover, when this water quality control system 20 carries out link operation with the blow drainage system 9 prepared conventionally, the reclaiming tower 5 of power generation generation water, and a demineralizer 6, cooling water supply equipment equipped with the function to prevent automatically concentration of the impurity contained in cooling water 10A in the cooling-water-flow system 10 is constituted.

[0015] That is, when conductivity of ion-exchange-water 10E obtained by the demineralizer 6 is set into 0.1microS/cm in an example and silica concentration is set to 0.02 ppm, the value about several times the value of above-mentioned is beforehand set as the control section 23 as a reference value. If a generating mode is performed in this state, while solid impurities, such as impurity ion in cooling water 10A and a silica, will be gradually condensed in the process which supplies steam 4S which the steam eliminator 4 separated to the fuel reformer 2 and operation time will pass, the high impurity concentration in cooling water 10A goes up gradually. Solid impurities, such as a silica which detects concentration of the chloride ion from which the feature of this example causes [of a liquid junction phenomenon] generating, calcium ion, magnesium ion, etc. by the sensor 21 for conductivity measurement as a fall of ion conductivity, and cannot be detected by the sensor 21 for conductivity measurement by the sensor for conductivity measurement, are in the point detected by the sensor 22 for silica density measurement. Therefore, if one of detection values exceeds each reference value, opening instruction 23S will be outputted towards the blow groin valve 28 from a control section 23. Based on this, the flow rate of blow water 10C is controlled, pure water 10E processed by the part and the demineralizer 6 flows back to the steam eliminator 4, and the high impurity concentration in cooling water 10A is diluted. The power generation performance degradation by the liquid junction phenomenon and the cooling performance degradation by deposition of a scale can be prevented beforehand.

[0016] Moreover, since the water quality in the cooling-water-flow system 10 can be held on fixed level with the automatic control of the amount of conduction of blow water when the cooling water supply equipment of two or more fuel cell power plants for on-site power supplies has a difference in the water quality of a mixed water, or the adsorption capacity force of ion exchange resin, respectively, the advantage which can manage the water quality of the cooling-water-flow system of two or more sets of fuel cell power plants on fixed level, without hardly needing an effort is acquired.

[0017] In addition, with regards to the water quality of mixed-water 10B, and the impurity removal performance of a demineralizer 6, it is

decided any shall operate between the sensor 21 for conductivity measurement, and the sensor 22 for silica density measurement. Therefore, the advanced water quality function manager who can prevent automatically generating of the liquid junction phenomenon resulting from the fall of conductivity and deposition of a scale is obtained by deciding the combination of a sensor with careful attention to this point. Moreover, only the sensor for conductivity measurement is formed, and only the sensor for silica density measurement is formed and you may make it simplify the composition of a water quality control system in the equipment which a solid impurity tends to deposit with the equipment to which concentration of impurity ion tends to take place conversely.

[0018] When the unusual detecting signal which, on the other hand, exceeds sharply the reference value with which a control section 23 becomes settled beforehand from the sensor 21 for conductivity measurement or the sensor 22 for metal ion density measurement in drawing 1 is received, If it constitutes so that information instruction 23A may be outputted towards the unusual alarm which is not illustrated By the operating staff which received the alarm of this unusual alarm judging it as what the capacity fall generated in the demineralizer, for example, performing exchange of the filter medium of a filter, and exchange of ion exchange resin The advantage which it becomes possible to also manage the maintenance timing of a demineralizer 6 equally using the water quality control system 20, therefore can equate further water quality management of the cooling-water-flow system of two or more fuel cell power plants for on-site power supplies is acquired.

[0019]

[Effect of the Invention] The cooling water supply equipment of the water cooling type fuel cell of this invention formed the water quality control system which becomes the cooling-water-flow system of a water cooling type fuel cell from the sensor for ion concentration measurement, and its control section as mentioned above, and when the ion concentration in cooling water exceeded default value, it constituted it so that the amount of blow water conduction might be increased. Consequently, since cooling-water supply equipment supplies pure water automatically corresponding to the amount of blow water conduction and dilutes the ion concentration in cooling water, concentration of the ion concentration in the cooling water which became a problem with the conventional technology is avoided, and the water-cooling-type fuel cell power plant equipped with the cooling-water supply equipment with which the cooling performance which there is no generating of a liquid-junction phenomenon and a scale, and was stabilized is obtained can offer. Since the water quality in a cooling-water-flow system can be especially held on fixed level with the automatic control of the amount of conduction of blow water when the cooling water supply equipment of two or more fuel cell power plants for on-site power supplies has a difference in the water quality of a mixed water, or the adsorption capacity force of ion exchange resin, respectively, the advantage which can manage the water quality of the cooling-water-flow system of two or more sets of fuel cell power plants on fixed level, without hardly needing an effort is acquired.

[0020] Furthermore, the advantage which can perform water quality management with a more high precision using both complementary operation is acquired by forming the sensor for conductivity measurement, and the sensor for metal ion density measurement. On the other hand, the advantage which it becomes possible to also manage the maintenance timing of a demineralizer equally, therefore can equate further water quality management of the cooling-water-flow system of two or more fuel cell power plants for on-site power supplies is acquired by adding an alarm function to a water quality control system.

[Translation done.]